

United States Department of Agriculture,

DIVISION OF AGROSTOLOGY.

[Grass and Forage Plant Investigations.]

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., April 9, 1900.

SIR: I have the honor to transmit herewith and recommend for publication as a circular of this Division the information now in hand relative to the Turkestan alfalfa imported and distributed by you in 1898 and 1899.

Respectfully,

Hon. JAMES WILSON,
Secretary of Agriculture.

F. LAMSON-SCRIBNER,
Agrostologist.

TURKESTAN ALFALFA.

(Medicago sativa var. Turkestanica.)

This variety of alfalfa was secured from Russian Turkestan by Prof. N. E. Hansen while engaged as agricultural explorer in the Section of Seed and Plant Introduction in 1898. The localities from which the seed was collected represent a wide range of climatic conditions, as follows: Inventory No. 469, from the Turkestan Agricultural Society, Turkestan; 679, from Bokhara; 991 and 1101, from Tashkend; 999, from Uralsk Agricultural School; 1150 and 1151, from Djarkent; 1169, from Merke; 1295, from Samarkand—all in Turkestan, and 1159, from Kopal, Siberia.

THE CLIMATE OF TURKESTAN.¹

Russian Turkestan is about two-fifths as large as the United States, with a population of 3,000,000, and yet for the most part it is a vast tract of country consisting of either steppes or marshlands. A considerable portion of the country is not adapted to settled agriculture; so that the inhabitants are mainly employed in cattle raising. The climate of Turkestan, far removed as it is from the ocean and closed in on nearly every side by wide stretches of dry land, is not unlike that of many of our interior States. The summers are very hot, cloudless, dry, and long, lasting from five to five and one-half months; the autumns and springs are mild and rainy, and the winters usually

¹ The Industries of Russia, 3: 444. 1893.

open, with but little snow. Severe frosts occur sometimes, but these very rarely last long. In many places the evaporation exceeds by many times the quantity of moisture that has fallen in the course of the year. From May to September very little rain falls, often only 1.1 inches, and in many parts of the steppe regions, which are removed from the mountainous districts, there is absolutely no rain during the entire summer season. Dry winds from the north and northeast prevail during the summer, with a temperature of about 130° F. (40 degrees Celsius), which generally dry up the whole Turkestan basin until vegetation can not exist without irrigation. The extent of watered lands in Turkestan is, in comparison with its whole area, by no means great, not more than 2½ per cent, which is altogether insufficient for the subsistence of its population. This deficiency is partially redeemed by the growing of wheat, barley, and millet, which depend on the winter moisture in the soil and a sufficient fall of rain during the spring.

SUPERIORITY OF TURKESTAN ALFALFA TO EUROPEAN VARIETIES.

The following extracts from an article by Prince V. I. Massalski, of the Russian Department of Agriculture, show its greater value to the arid regions of Russia than the European varieties:¹

Lucern clover (*Medicago sativa* var. *Turkestanica*) is the chief forage in use throughout Central Asia, and to the settled population of Turkestan is of the highest importance, since during the summer it forms the chief and in winter, prepared in the shape of hay, the only fodder for cattle. It is of all the greater importance because, within the regions populated by settled inhabitants, there are no meadows. Soft herbs and other grasses that grow up in the early spring in certain parts of the steppes are quickly dried up by the hot rays of the sun and give place to coarse, prickly stubble or, in any case, to less nutritive grasses that are in general unfitted for sheep, camels, or steppe cattle, and still less fitted for horses or the cattle of those who are settled in the oases and are thus closely confined to the foreland or rivers, in most cases far removed from the steppes.

Massalski describes the native methods of cultivation and irrigation, and continues—

The native lucern would seem to be a cattle fodder that can not be replaced in countries as dry and hot as Turkestan and the Transcaspian Province. Parallel experiments that have been made in the Merv oases, in the Transcaspian Province, in growing native and French lucern, under widely different conditions of water supply, have shown that the native lucern, particularly where there is a lack of water, is vastly superior to the French in the crop it yields, and that it is able to grow satisfactorily with a minimum supply of water, a supply so small that the European lucern would perish with drought. It possesses a very large root system, and its leaves are covered with thick down. This, in conjunction with a deeply channelled leaf, enables the plant, on the one hand, to imbibe the moisture from the deeper layers of the soil and, on the other hand, to exhale it in very small quantity.

¹ The Industries of Russia, 3: 459. 1893.

DISTRIBUTION OF THE SEED.

(See Table I.)

In 1898 and 1899, 1,101 packages of the seed of Turkestan alfalfa, of from $2\frac{1}{2}$ to 20 pounds each, were distributed by the Secretary of Agriculture through this Division, and a still larger quantity was distributed through the Section of Seed and Plant Introduction. This distribution included experimenters in forty-seven States and Territories. Unfortunately, owing to the primitive conditions prevailing in the region in which the seed was collected, it was not clean when received, and had to be carefully inspected and freed from all weed seeds before being distributed. This occasioned such a delay in sending the seed out that for most localities it was too late for spring sowing. Many experimenters planted the seed immediately upon receiving it, and thus subjected the young and tender plants to the dry, hot summer weather, which in many cases killed the alfalfa, as the roots had not a sufficiently strong hold on the ground to enable them to withstand the drought. Some have been holding the seed for a favorable season in which to sow, and have not yet planted it, but expect to do so the present season.

As this variety of alfalfa was introduced especially for the semiarid regions, the largest consignments of seed were sent to the following States: California, 48 packages; Colorado, 77; Idaho, 21; Kansas, 97; Montana, 38; Nebraska, 49; New Mexico, 30; North Dakota, 26; Oklahoma, 37; Oregon, 27; South Dakota, 20; Texas, 318; Washington, 28; and Wyoming, 21. The number of experimenters to whom seed was sent in each of the States and Territories and the number and character of the reports received are given in Table I.

REPORTS RECEIVED FROM VOLUNTEER EXPERIMENTERS.

A total of 466 reports have been received, and of this number 237 are satisfactory and 229 unsatisfactory. (See Table I.) A report in this experiment has been termed "unsatisfactory" unless the Turkestan alfalfa has proved in some quality to be superior to the common alfalfa. Included in the 229 unsatisfactory reports are 76 which state that owing to the seed being received too late in the season, or because of the unfavorable weather or conditions, it has not yet been planted.

TABLE I.—*Distribution of seed of Turkestan alfalfa and number and character of reports received from experimenters.*

States.	Number of experi- menters.	Number of reports satis- factory.	Number of reports unsatis- factory.	Total.
Alabama	11	1	-----	1
Arizona	13	1	2	3
Arkansas	11	2	4	6
California	48	8	11	19
Colorado	77	11	18	29
Connecticut	1	-----	-----	-----
District of Columbia	10	-----	3	3
Florida	5	-----	2	2
Georgia	6	-----	1	1
Idaho	21	3	4	7
Illinois	9	1	3	4
Indiana	12	5	2	7
Indian Territory	4	-----	-----	-----
Iowa	17	3	3	6
Kansas	97	39	22	61
Kentucky	9	1	2	3
Louisiana	7	2	4	6
Maine	1	1	-----	1
Maryland	2	1	2	3
Massachusetts	5	-----	-----	-----
Michigan	3	-----	-----	-----
Minnesota	10	4	2	6
Mississippi	11	2	3	5
Missouri	16	3	5	8
Montana	30	22	7	29
Nebraska	49	14	12	26
Nevada	10	4	-----	5
New Jersey	1	-----	-----	-----
New Mexico	30	3	5	8
New York	10	2	1	3
North Carolina	4	1	4	5
North Dakota	26	8	4	12
Oklahoma	37	6	8	16
Ohio	15	1	3	4
Oregon	27	6	5	11
Pennsylvania	8	4	1	5
Rhode Island	1	-----	-----	-----
South Carolina	4	-----	1	1
South Dakota	20	9	3	12
Tennessee	7	3	2	5
Texas	318	43	60	103
Utah	18	4	4	8
Virginia	16	1	-----	1
Washington	28	5	6	11
West Virginia	6	1	1	2
Wisconsin	9	1	2	3
Wyoming	21	8	6	14
Total	1,101	237	229	466

The following testimonials from the experimenters will in some degree indicate the value of Turkestan alfalfa in the different States.

ARKANSAS.

Mr. C. T. Burns, Lynn, Lawrence County :

Alfalfa is practically unknown here. The seed received was sown under favorable conditions and came up well, but about the time it began to show green over the field, we had a long drought which killed out many of the plants. I think if I can get a stand it will be of great value, and on rich land the productiveness will exceed any of the grasses. I should have sown earlier.

Mr. H. N. Jameson, Calhoun, Columbia County :

Alfalfa has never been sown before in my immediate neighborhood. I selected a thoroughly drained, rich, loamy, well-prepared soil, which received no fertilizers. The seed came up well, but the young plants were washed over by a waterspout on the 12th of May and ruined. I believe alfalfa will grow here.

CALIFORNIA.

Mr. J. J. Dean, Moneta, Los Angeles County:

I prefer the Turkestan alfalfa to our common alfalfa, as it was up eighteen days earlier; is not so woody; has more and larger leaves and grows more rapidly. It is hardy, keeps green, and is not as easily injured by frosts as the other varieties. For dairies it is the best. My cows prefer it. The Turkestan alfalfa that I sowed June 5, 1898, I have cut nine times this year (1899), the growth being about 18 inches each time. The crop was irrigated with deep-well, sulphur water.

Mr. M. Hartley, Dehesa, San Diego County:

I received the seed too late to sow in 1898, which was a dry year with us, and so also was 1899. The creek did not run through my place, so the bottom land was wet only on the surface. However, I sowed the seed in March after a good rain. It came up beautifully and grew very well for about two months, when the vegetation dried up on the highlands and caused the quail and rabbits to flock in from all sides, and they destroyed almost every growing thing, including the Turkestan alfalfa.

Mr. W. H. Old, Chualar, Monterey County:

There is no particular variety of alfalfa grown in this part of the country, and very little attention is given to any kind. I secured a beautiful stand of the Turkestan alfalfa, 90 per cent or more of the seed germinating. It seems to have the power to withstand drought well, as last year was unusually dry. It is hardy and extra early.

Mr. J. R. Robinson, Lancaster, Los Angeles County:

The Turkestan alfalfa is doing well for the first year. It was cut three times. I shall save the seed for future use, as it is difficult to determine its value from a single year's experiment. It was not affected by a temperature of from 100 to 110 degrees.

COLORADO.

Mr. F. E. Ewing, Hugo, Lincoln County:

I have experimented with Turkestan alfalfa for two seasons. The past season was unusually dry, yet this variety of alfalfa withstood the drought well. The growth was only about 12 inches high, but the plants were strong and vigorous. The crop was not irrigated at any time, and we had but one good rain during the season.

Mr. Adolph Froelich, Aroya, Cheyenne County:

A sandy loam, broken last season, was plowed about 6 inches deep this year. The seed was sown broadcast, May 9, 1899, when the ground was very dry, and harrowed in. We had less than the usual amount of rain; in fact, the driest season in eighteen years. The Turkestan alfalfa began to bloom on August 1, and I cut it with a scythe and left it on the ground. It soon grew up again 18 inches high. Part of it was irrigated when sown, and again on the 8th of August. That irrigated has a fine stand, but that not irrigated was a total failure, only twenty-five plants coming in a plot 150 by 100 feet. This variety held its own better after it came up than our common alfalfa would have done; that is, where a good stand was first obtained by irrigation.

Mr. D. Y. Hamill, Seguro, Huerfano County:

The first year, 1898, the Turkestan alfalfa proved to be a quick, strong grower. I cut it when it was 2 feet 2 inches high. It afterwards made a growth of 2 feet

before the winter set in. The second season, 1899, was so cold and dry that the Turkestan alfalfa made only one-half a crop. After cutting, it leaved out and remained green till winter. Native grasses—oats, barley, and wheat—did not make one-half stand. Most of the common alfalfa sown in 1898 died in July or earlier, but the Turkestan alfalfa, which was sown on the level ground, grew well. One-sixth of that grown on the slopes died.

Mr. William Raymann, Deertrail, Arapahoe County :

I am in a very poor position this year to give you information, as we had such a very bad season—no rains until too late to be of any use. I plowed the Turkestan alfalfa, never thinking it would grow; but must confess I was surprised, as some of it came up. The crop suffered from an unusually long drought.

Mr. M. J. Weyand, Sedgwick, Sedgwick County :

The Turkestan alfalfa is of a darker-green color, has larger leaves, and grows taller. It will be a famous plant in two more years. It is early, grows rapidly, and would bring a good crop of hay even in a short season. The plant is perfect, but our water is scarce at times.

GEORGIA.

Mr. E. J. Hartman, Orr, Gilmer County :

The soil was well prepared and the seed sown broadcast about the end of May and the field lightly harrowed. It gave two good cuttings of excellent quality. This alfalfa has done wonderfully well on our soil. I have a fine stand now and hope to get excellent crops next year.

INDIANA.

Miss Kate A. Drake, Elkhart, Elkhart County :

A poor, sandy soil was plowed and harrowed. The seed was sown in the fall of 1898, after a rain. It came up nicely and grew well. We had a very severe winter, and some of it froze out, but a large part of it came on again in the spring. This grew well, some of it reaching 18 inches in height. The severe drought caused it to dry up, but did not kill it, as a part of it has come up this fall (1899) and looks very promising. I hope it will be a success. I would like to send you a report next summer after I see if it dries up again. I believe it will be adapted to our soil and prove a valuable acquisition to the drought-stricken parts of the country.

Mr. M. F. Eastman, North Vernon, Jennings County :

A clay loam was well prepared and the seed sown broadcast in March, 1899. The plat, 10 by 200 feet, has been cut three times this season, which has been very dry. The yields were very heavy at each cutting, estimated at 2 tons per acre. I believe it to be a paying crop if a catch can be secured, but, owing to its slow growth, it is difficult to get a stand.

KANSAS.

Mr. A. Y. Bentley, Wallace, Wallace County :

A good sandy loam that had been in cultivation for several years was used. The seed was sown May 12, 1898, and we had rain on the 13th and 14th. I mowed it when about 7 inches high and left it on the ground. The grasshoppers kept it eaten down to the crown, but it came up again and is a good stand now. I sowed several patches of common alfalfa in the spring and the grasshoppers took them all just as they did the Turkestan, which is the only patch that survived.

Mr. Ben Brown, Natoma, Osborne County:

A rich, light, prairie soil was plowed and harrowed twice. The seed was sown about May 27, 1898. A good stand was up by June 3. It grew well until checked by drought in July and August, but this did not seriously injure it. Since the heavy rains of September 8 to 14, it has grown from 8 to 10 inches high, and is now green. The field looks promising for future crops. I have 80 acres of common alfalfa, which I cut four times each season, getting from 4 to 6 tons to the acre. It does not give a full crop until the third or fourth year. If the Turkestan beats this it will do well.

Mrs. Sarah J. Gilmore, Norcatur, Decatur County:

The Turkestan alfalfa was sown on high upland and received no irrigation. In the summer of 1898 we were sixty-five days without rain, and the alfalfa lived through it, although the plants were small. I think it much better than the common alfalfa to withstand the drought.

Mr. J. G. Gray, Ottawa, Franklin County:

The Turkestan alfalfa is earlier, hardier, more productive, and grows more rapidly than the common alfalfa.

Mr. H. C. Hallowell, Barnes, Washington County:

A dry, black loam was plowed early and harrowed. The seed was sown broadcast about May 20, 1898, and harrowed in. The growth was short, but it stood the dry weather well. I think it better than our common alfalfa.

Mr. C. H. Jackson, Kidderville, Hodgeman County:

The seed was sown May 12, 1898. The alfalfa grew about 6 inches high by the first frost. The dry weather tested it severely, but it would green up now if we had a little rain. This is the only variety that seems to offer a chance for a crop in this part of the State.

Mr. Don. F. Lyman, St. Francis, Cheyenne County:

The Turkestan alfalfa differs from the common variety in having smaller stems and larger roots. It is very hardy, early, quite productive, and grows until very late in the season. The growth of this alfalfa last summer was surprising, as the season was very dry and hot. I believe it is going to be a success here.

Mr. Mads. Olson, Mullinville, Kiowa County:

The soil was second sod in good condition. The seed was drilled in the last day of May, 1898. It came up well and was nicely in bloom when the grasshoppers came and destroyed it.

Messrs. Wm. B. Sutton and Son, Russell, Russell County:

A piece of new black loam was broken and finely cut with a disk. The seed was sown broadcast about May 1. The season was very dry, but I obtained a fine stand, 8 inches high. It withstood the drought well, and is now growing quite nicely. This has been a poor season to test it. A four-year old field of common alfalfa made only one small cutting in June. There was no rain in June, July, or August.

Mr. Theo. Swartz, Salina, Salina County:

The Turkestan alfalfa seems to have finer stems and smaller leaves, which are considerably darker green in color than the common alfalfa. The seed came up evenly, made a good start, and looks fine at present, comparing very favorably with the common alfalfa sown at the same time. As I only sowed in May, 1899, it is too soon for me to judge of its special qualities.

MASSACHUSETTS.

Messrs. Jas. H. Gregory & Son, Marblehead, Essex County:

We planted a small sample of Turkestan alfalfa from your Department, and noted that it made quite 50 per cent more plant and stood the winter better than the common alfalfa planted by its side.

MINNESOTA.

Mr. C. F. Miller, Faribault, Rice County:

I have experimented two seasons with the Turkestan alfalfa and find it very productive. I think from its behavior that it will succeed in the Northwest. The common alfalfa is uncertain here.

MONTANA.

Messrs. W. W. Gamble & Son, Burton, Choteau County:

A gravelly soil on bench land was well plowed and harrowed. The seed was sown broadcast May 19, 1898, with a hand-seeder. No cultivation except irrigation was given the crop. It was in full bloom in July and ripened in August. The quality of the product was good. This seems to be a better plant in its growth than the ordinary alfalfa. The winter of 1898-99 seemed quite trying to alfalfa, with a tendency to winter-kill. In the spring of 1899 our ordinary alfalfa came up bunchy in appearance, and although it recovered itself later in the season, the growth was irregular. The Turkestan alfalfa, however, grew even and uniform throughout the season under precisely the same conditions. It is probably a better variety than the ordinary sort sold here.

Mr. W. H. Heileman, Kalispell, Flathead County:

The soil was very light, sandy, and open, varying to a black, sandy loam. The land was plowed thoroughly, harrowed, then rolled and harrowed again. The seed was sown broadcast and the land then smoothed with a harrow and rolled. It came up May 18, and was in full bloom by July 28. The crop was cut with a mower along with the weeds. So far as the experiment has gone it is very promising. I think the alfalfa has done remarkably well for the first year. The season was very hot and dry, with no rain after June, but the drought did not seem to affect it. It was about fourteen inches high on July 28, 1898. The winter of 1898-99 was very severe, but none of it was winter-killed. The fore part of the season of 1899 was very dry, but a great deal of rain has fallen since August 1st. The plat of Turkestan still continues to do well. It was pastured by hogs till May 28 and then let go for seed. It made a great growth, but did not fill well, the cold weather probably preventing the production of seed. After cutting, the alfalfa grew up again rapidly, I think it is going to be more valuable than the common variety. It seems to do well on alkali spots. I would advise all to sow it as soon as they can secure seed.

Mr. Len. Lewis, Lewis, Meagher County:

Dry, limestone, bench land was used. A good, strong growth was secured. It seems to be hardier than the ordinary alfalfa. I think it is highly satisfactory.

Mr. Emory Vine, Miles City, Custer County:

The Turkestan alfalfa wintered well and is coming on this spring as if it meant business. At the present time it has a decided advantage over our common French alfalfa. It shows green several rods away, while the common variety sown last season has not started to green yet.

NEBRASKA.

Mr. J. A. Anderson, Harrison, Sioux County :

A sandy soil in good condition was thoroughly prepared and irrigated. The seed was sown with oats May 15, 1898. The quality of the product was good, and I think it will make a valuable forage plant in this section. It did better than the ordinary alfalfa.

Mr. W. Benjamin, Banksville, Red Willow County :

From the short experience I have had with the Turkestan alfalfa, I believe it will succeed in our dry climate when it once gets acclimated. My experiment was handicapped by jack rabbits, cottontails, and grasshoppers destroying the plants.

Mr. T. R. Butler, Beaver City, Furnas County :

The outlook is encouraging. I can hardly tell yet whether it has any special qualities over the common alfalfa, but I think it has. It came up well, producing a good stand when the common alfalfa was killed out by drought.

Mr. J. W. Williams, Weeping Water, Cass County :

A thin, black loam was plowed and harrowed. The seed was sown broadcast May 25, 1898. The alfalfa made a very heavy growth, withstood our short drought very well, and is still in excellent condition. It did much better than our common alfalfa for the first year.

NEVADA.

Mr. H. C. Campbell, Skelton, Elko County :

The Turkestan alfalfa does not seem to require as much water as the common alfalfa.

NEW MEXICO.

Mr. J. A. Gishwiller, Roswell, Chaves County :

A good clay loam was plowed three times and harrowed fine. The seed was sown broadcast July 13, 1898, and covered with a harrow. I secured a good stand. The growth was strong and vigorous, somewhat stronger than that made by our common alfalfa sown on adjoining land. Another season will be necessary to compare it well with the common alfalfa.

NORTH DAKOTA.

Mr. Joe Horsky, Anamoose, McHenry County :

No other varieties of alfalfa are grown in this vicinity. The Turkestan alfalfa seems to be hardy both as to drought and cold so far.

Mr. W. Loughland, Nesson, Williams County :

I am pleased to report very favorably on the Turkestan alfalfa received from your Department. I had 7 acres sown to the common alfalfa, which was all killed off in the winter of 1898-99, while the Turkestan variety, which was sown May, 1898, was not affected in the least. This winter, 1899-1900, we are having no snow, and I am looking forward to its withstanding the frosts. If it does that, it is just the plant that is wanted here.

Mr. C. M. Lovett, Pingree, Stutsman County :

The seed of the Turkestan alfalfa gave a poor stand at first, but thickened up remarkably well after the fall rains. It seems to be easier to get a catch with this variety than with the common alfalfa. I think it is promising.

Mr. C. F. Miller, Harmon, Morton County :

Alfalfa has never been tried in this neighborhood to my knowledge. The Turkestan alfalfa was sown May 2, 1899. The plants came up within ten days and grew vigorously till injured by frost on June 1. During two weeks of warm weather they started again from the roots and grew until December, when growth was checked by frost.

OKLAHOMA.

Mr. C. L. Boyd, Redmoon, Roger Mills County :

A black, sandy, bottom soil was broken early in February, rebroken at the time of seeding, and harrowed down fine. The seed was sown broadcast May 5, 1898, and the land was then harrowed and rolled. The quality of the Turkestan alfalfa was the finest I have ever seen. I sowed alongside of it a plot of the common alfalfa, and there was a marked difference between them, the Turkestan variety growing much ranker. I think the Turkestan alfalfa the more valuable variety.

Mr. W. A. Rowan, Gallienas, Beaver County :

A sandy soil was plowed, well pulverized, and put in fine condition. The seed was sown broadcast May 9, 1898, and harrowed in. The field was irrigated about May 25, and again on June 20. I secured a good stand, but the alfalfa does not mature sufficiently the first year to make a good crop. It was sown by the side of common alfalfa and given the same care. The Turkestan variety seems to be stronger and hardier. The value of a good stand would be about \$30 per acre.

OREGON.

Mr. F. T. Byrd, Pilot Rock, Umatilla County :

I found the Turkestan alfalfa a superior drought-resisting plant. My experiment was seriously interrupted by the continued freezing and thawing last winter. The plants grew splendidly through the longest and hottest summer ever known in Oregon.

Mr. A. Wintermier, Silvies, Harney County :

A decayed lava and clay soil was used. The Turkestan alfalfa came up very nicely, with an even stand. When about 3 inches high a severe frost cut it down. It grew up again, however, but was a second time cut down by frost, and still it grew to be 1 foot high. Apparently it will not stand frost as well as the French alfalfa, but seems to be better adapted to dry soils. Another year will determine what it will do in this part of the country.

PENNSYLVANIA.

Mr. J. O. Brown, Pittsburg, Allegheny County :

Alfalfa of any kind is a new plant here. I have tried Wisconsin, Nebraska, and Turkestan seed, and I think the last mentioned germinates best and is the most hardy. The few plants that were not destroyed by grasshoppers in the summer of 1898 started to grow earlier in the spring of 1899 than the American alfalfa and, I think, stood the extremely cold winter better. The hot, dry summer seemed to have about the same effect on both kinds, but I think the Turkestan variety recovered quicker in the fall. I have gathered sufficient seed from the sowing of 1899 to double the amount of ground.

SOUTH DAKOTA.

Mr. H. C. Clifford, Casey, Ziebach County:

In May, 1898, you placed in my charge Turkestan alfalfa seed. I planted it May 16 on four different plats.

Plat No. 1.—A black, sandy loam was used. I gave it plenty of water, and the alfalfa came up in four days and grew well. On July 12, when 1½ feet high, it was cut, a plat 40 by 100 feet yielding 1,200 pounds. I cut it again September 20, when about the same height as before, and it yielded 1,500 pounds. I think it away ahead of the American alfalfa, as a two-year-old field of alfalfa, such as we commonly grow in South Dakota, did not yield any better, if as well.

Plat No. 2.—A gravelly and sandy loam was used. The alfalfa came up nicely although I did not water it, growing to a height of from 4 to 6 inches, where it remained and kept green, although the season was very dry and hot.

Plat No. 3.—A rich, black loam was used. The plants grew 2 or 3 inches tall and then died out.

Plat No. 4.—A white, gumbo land was used. The plants came up but did not amount to anything.

Plats Nos. 3 and 4 were sown with oats. The oats grew well, and my opinion is that alfalfa will do better alone, as the oats seem to smother it. Nos. 2, 3, and 4 got only the moisture from the natural rainfall, which was merely sufficient to start it. As to whether it will endure the winter or not, I can not say as yet.

Mr. W. H. H. Phillips, Brookings, Brookings County:

A black loam, with a clay subsoil, was well harrowed and made fine. The seed was sown broadcast about May 20, 1898. In March, 1899, it was covered with barnyard manure. On May 17, 1899, it froze somewhat, which gave the weeds a start. I mowed it early in July. Since then it has made a good growth. The first year it made but little growth, but now (October, 1899) it is very promising.

Hon. H. C. Warner, Forestburg, Sanborn County:

A black, sandy loam was plowed deep in the spring and well prepared. The seed was sown broadcast April 24, 1898, and harrowed in. The stand was perfect, and notwithstanding the drought of summer, and the cold, open winter, without snow, the plants came through in perfect condition. The Turkestan alfalfa was not cut this season, judging that it is better to let it become well established first. Every root of common alfalfa growing by the side of it was killed.

TEXAS.

Mr. Severin Ball, Lytle, Atascosa County:

A black, sandy land was used. I planted the seed the latter part of October, and would have sown earlier, but the ground was too dry. The alfalfa seemed to grow very slowly during the winter; apparently the weather was too cold for it to grow rapidly. As it is only a few months since it was sown, I can not say much about it yet. It seems, however, to be vigorous and long-rooted at the present time.

Mr. J. W. Cartwright, Amarillo, Potter County:

The seed was sown the latter part of September, 1899. The alfalfa came up nicely, and now looks well, with four inches of snow on the ground. I am quite proud of this, and will report later on.

Mr. T. A. Coleman, San Antonio, Bexar County :

The Turkestan alfalfa grows luxuriantly here and makes fine hay.

Mr. Wm. Fancher, Taopi, Fisher County :

A dark, sandy loam, with clay subsoil and containing some alkali, was used. The seed was sown October 15, 1899, in very dry weather, but it came up very well and produced a good stand by November 1. Thus far the Turkestan alfalfa has done well in this section. I think it will stand the drought well.

Mr. B. H. A. Groth, Selma, Bexar County :

A loam with plenty of lime in the soil was used. The soil in this section does not need drainage, from the fact that for the most part there is nothing to drain, and when there is, the subsoil, a sandy loam, will take it up. The seed was sown April 8, 1899. Last season we suffered from a severe drought. From the 1st of July to the 1st of November there was no rain, and from the middle of July to the last of August the weather was extremely hot. I can as yet answer only to the hardiness of the Turkestan alfalfa. It is green now (January 2, 1900), and we have had some ice on water in vessels. I believe the Turkestan alfalfa will withstand our dry climate and furnish us a good forage plant.

Mr. J. Q. Hanna, Olga, Nolan County :

The 1898 sowing on what we call black land was a complete failure. The 1899 sowing is showing well on the sandy land. That it is now standing leads me to be very hopeful. I do not know whether the seed will mature here without irrigation; the common alfalfa will not. I have faith that the Turkestan alfalfa will prove a success here. If so, its value can not be overestimated. It will be worth millions to the stockmen of Western Texas.

Mr. George Hoeffert, Schulenburg, Fayette County :

A heavy, black soil was used. The seed was planted about the middle of March, at the same time as some California alfalfa. The Turkestan variety came up sooner and produced a better stand on the same soil. It seems to be earlier, harder, more drought-resisting, and more valuable than the California alfalfa.

Mr. S. R. Jeffery, Graham, Young County :

A sandy loam was used. I planted the Turkestan alfalfa in drills in the fall of 1898. It came up perfectly, but a very severe winter followed and killed out the greater part of it. In the spring it came rather late and very thin. I did not cut the plants nor allow them to be grazed. They grew to be two and one-half feet high and seeded. We had the driest and hottest summer for years, but the stems of the Turkestan alfalfa kept green through it all, and when our fall rains came numerous shoots came up all around the old plant. It is now, December 28, from eight to twelve inches high, looking very green and fresh. I think it will be a great plant for this section of the State.

Mr. Geo. Loeloff, Hellemans, Bexar County :

A dry, black soil mixed with clay was used. The seed was sown October 1, 1899, so that the plants could be compared with Colorado seed. The leaves are similar but somewhat broader in the Turkestan variety. On examination of the seedlings of both varieties thirty days after sowing, when three inches high, the Turkestan alfalfa appeared more robust, more leafy, stronger and deeper rooted than the Colorado alfalfa. Further comparison at a later date, December 23, showed these differences to be even more pronounced.

W. S. Marshall, Channing, Hartley County :

I believe that the alfalfa from Turkestan is a more valuable plant for this section than the common variety. It withstands the drought much better, seems to be hardier, starts very early in the spring, and is very productive.

Mr. P. P. McDermatt, St. Joe, Montague County :

A black, waxy, somewhat sandy land was used. The seed was planted in the spring of 1899. I have not grown this variety long enough to give a full report on it. I secured a good stand and it withstood the extreme drought of last summer. I expect to get seed from it the coming season.

Mr. H. B. McCurry, Fate, Rockwall County :

The Turkestan alfalfa seems to be a splendid drought-resister.

Mr. R. T. Shelton, Anna, Collin County :

A well-drained, black, waxy soil was used. The seed was sown April 15, 1899. The drought began this summer in July and lasted until the middle of October. The native variety was dried up, while the Turkestan remained green.

Mrs. H. P. Thomas, Ector, Fannin County :

The seed was sown by the side of the native variety. The Turkestan alfalfa made the stronger growth, being almost twice as large. It stood the summer drought very well.

Mr. J. W. Tillerson, Roseland, Collin County :

A black, waxy soil was used. The Turkestan alfalfa is the only variety we have tried. It seems to be early, hardy, and productive, and will be valuable for hay and pasture.

Mr. Arnott West, Brownwood, Brown County :

A rich, deep, black, slightly ashy soil was used. The quality of the product was good, and altogether throughout the season would produce from eight to ten tons per acre. This variety stands the dry weather splendidly in this part of the country if it has a deep, well-drained soil. Alfalfa should be grown here exclusively. I am feeding two hundred steers on it and they are getting fat.

UTAH.

Mr. James Lofthouse, Paradise, Cache County :

The seed was sown broadcast, May 28, 1898, on a clay loam. The alfalfa bloomed July 25, but was destroyed by stock before ripening seed. It stands drought better than the kind of alfalfa commonly grown here. It grew eighteen inches high, and outgrew the common alfalfa under similar conditions.

Mr. Samuel Roskelly, Logan, Cache County :

A dry, sage-bush upland, that had been cultivated in wheat for three years, was well plowed and harrowed. The seed was sown broadcast May 9, 1898, and harrowed in lightly. I consider this one of the best and most valuable fodders for dry farms, which are not irrigated, in this western country. I have raised common lucern for twenty years, but for drought resistance I think this is better. My experience is that seed should not be raised from first year's growth, as cutting before maturity causes it to send the roots down to find moisture.

WASHINGTON.

Mr. N. S. Dickinson, Clover, Okanogan County:

The soil was black loam with a clay subsoil. The seed was sown May 15, 1898, and irrigated the first season. The summer of 1899 I let it go to seed, but lost it all on account of heavy rains. I think it is a good variety for this climate. It seems to be earlier than the kind commonly sown here and makes a finer quality of hay.

Mrs. M. A. Kuehn, Valley, Stephens County:

A sandy soil was fertilized and irrigated, and the seed planted in drills about June 10, so as to avoid frosts while the plants were young and tender. The field was irrigated about every eight days. I have a very good stand of alfalfa, and am satisfied this is a good section for growing it. There is no alfalfa grown in this vicinity that I know of, and few people seem to know of its forage value. My Turkestan alfalfa was not affected by drought or cold. I have great faith in it as a food for all kinds of stock.

WEST VIRGINIA.

Mr. Ira C. Snider, Avon, Doddridge County:

The land is a loose, well-drained, sandy loam. The seed was sown April 3, 1899. I believe the Turkestan alfalfa will prove quite successful in this country for its hardiness, and its deep-rooting qualities will enable it to withstand the drought well.

WYOMING.

Mr. Edwin M. Howard, Sarver, Bighorn County:

I am growing the common variety and the Turkestan alfalfa, and am satisfied the latter is the more successful. I can see a difference in the bloom, and the hay is of a finer quality. It starts two weeks sooner than the common alfalfa, grows taller, and will produce more to the acre.

Mr. J. M. Rowsier, Farrall, Crook County:

The Turkestan alfalfa looks very much like the common variety, except that the stems are more slender and taller and grow finer. The experiment has proven that it is especially able to resist drought.

THE RESULTS OF EXPERIMENTS WITH TURKESTAN ALFALFA BY
THE STATE EXPERIMENT STATIONS.

Seed of Turkestan alfalfa was sent to Experiment Stations in the following States:

Alabama, Arizona, California, Colorado, Connecticut (Storrs Station), Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York (Cornell and Geneva Stations), Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Dakota, Texas, Utah, Washington, and Wyoming.

Reports have been received from the Experiment Stations as follows:

ALABAMA.

Canebrake Experiment Station, Uniontown.

The Turkestan alfalfa was planted in March, 1899, and cut for hay three times during the season. It stood the dry fall and winter freezes fairly well, but not so well as our common *Medicago sativa*. The plat is now (March 28, 1900) in a flourishing condition, with plants about 8 inches high, which will be ready to cut for hay in about fifteen days.—H. BENTON, *Director*.

CALIFORNIA.

State Experiment Station, Berkeley.

Seed of Turkestan alfalfa sent to the California Experiment Station by the Section of Seed and Plant Introduction, Department of Agriculture, was forwarded by me to the substations and also planted at the central station. This was in March, 1898. The season was dry to very dry throughout California, and even in favorable seasons alfalfa should be planted in the autumn, with the first rains, or not later than January.

At the central station the seed was sown on good soil and had more rainfall than at other places. The Turkestan variety showed no especial peculiarity in the season's growth, excepting that it was more compact than other alfalfa.

The seed sent to the Amador County substation (elevation 2,000 feet) in the Sierra foothills grew excellently without irrigation, but was badly eaten down by rabbits.

At Pomona, in the Chino Valley, Los Angeles County, the Turkestan alfalfa was tested on alkali soil and on arid, sandy soil. In both of these localities it proved superior in drought resistance to the common variety.

The best test of this alfalfa was at Paso Robles substation, San Luis Obispo County. The total rainfall of season was about 5 inches, distance to water nearly 200 feet, and the soil shallow and very poor, on deep hardpan. The only two species of forage plants which endured these conditions and remained green during the summer without irrigation were Turkestan alfalfa and Australian saltbush (*Atriplex semibaccata*). The latter made growth and furnished more fodder, but the former promises well and deserves much more extended trial under similar conditions.—C. H. SHINN, *Inspector of Stations*.

COLORADO.

State Experiment Station, Fort Collins.

Of the Turkestan alfalfa furnished by the Department of Agriculture last season most was distributed by Professor Cooke, of the agricultural section. Some was tried at the substation at Rocky Ford and at Cheyenne Wells. A good part of the seed was sown on the elevated ridge between the Arkansas and Platte rivers known as the Divide. The results have been rather negative; that is, the plant has not been especially better than our alfalfa, which is the common plant grown in Colorado under irrigation. It was a poor stand at Cheyenne Wells, which is not irrigated, and did not do so well on the Divide, which is also without irrigation.—L. G. CARPENTER, *Director and Irrigation Engineer*.

CONNECTICUT.

Storrs Experiment Station, Storrs.

The Turkestan alfalfa received from the Section of Seed and Plant Introduction was sown April 21, 1898. The soil is a medium heavy loam, with good natural drainage. The land was plowed, harrowed, and raked before seeding. For several years previously the plat of ground had been fertilized, mainly with mineral fertilizers. *Method of seeding:* Oats were first sown at the rate of about 2½ bushels per acre (designed as a protective crop); the alfalfa seed was sown on a fine seed bed, immediately after sowing the oats, at the rate of about 50 pounds per acre. The oats and alfalfa both germinated well and made a good growth for two or three weeks. We had a severe drought, lasting from the early part of May till after the middle of June, and during this period the alfalfa made a very slow growth. The oats were cut off rather high June 15, and again July 18. The weeds by this time had become quite thick, and, owing to the weak condition of the alfalfa plants, most of them died out during the latter part of the summer.—C. S. PHELPS, *Vice-Director*.

MASSACHUSETTS.

Hatch Experiment Station, Amherst.

The Turkestan alfalfa was sown side by side with alfalfa seed from a number of different sources, as follows: Arizona, Colorado, California, Utah, and Kansas. The seed from all sources was sown in rows in well-drained, medium loam. The plants were hand cultivated and hand weeded to give them a good start. The Turkestan variety proved among the least hardy. The plants were seriously affected by a parasitic growth upon the leaves, which appeared to be a rust which seriously weakened them, and at the end of the first winter nearly all were dead. The seed which came from Kansas and Utah gave the best results.—WM. F. BROOKS, *Agriculturist*.

FLORIDA.

State Experiment Station, Lake City.

A portion of the Turkestan alfalfa seed was sown upon new ground, prepared for the purpose, but, either through unadaptation to our climate or the exceedingly dry weather, it failed to germinate, so we did not succeed in securing anything like a satisfactory stand. My impression from so slight a trial is that it is not adapted to the dry soils of Florida, except where irrigation is possible.—H. E. STOCKBRIDGE, *Agriculturist*.

ILLINOIS.

State Experiment Station, Urbana.

The Turkestan alfalfa did not prove upon our grounds more hardy than other varieties and seemed unable to withstand the conditions.—A. D. SHAMEL, *Assistant in Agronomy*.

INDIANA.

State Experiment Station, Lafayette.

A small area, perhaps one-fortieth of an acre, was seeded to Turkestan alfalfa with seed obtained from the Department of Agriculture, Washington, D. C., in 1898. I recall that my former assistant thought this made a better growth than the home-grown alfalfa seed. By some oversight, however, he left no written record concerning it. My present assistant tells me that it did not stand the winter of 1898-99 as well as the home-grown seed, and that it did not consequently make as large a growth in 1899. It also seemed to be more affected with some leaf disease. This, however, is common to all alfalfa that we have grown here the second season. I think it due rather to the dry conditions and the hardpan layer from 1½ to 3 feet below the surface of the soil.—W. C. LATTA, *Agriculturist*.

IOWA.

State Experiment Station, Ames.

In the spring of 1898 one-quarter of an acre was seeded with Turkestan alfalfa, received from the Department of Agriculture. A similar area was seeded with the common alfalfa, 20 pounds of seed per acre being used in each case. Both crops flourished during the first season, and by fall the ground was completely occupied with plants. In January and February of 1899 the weather was unusually severe, so much so that clover throughout the State was killed. Not a solitary plant of the common alfalfa lived through the winter, and only about one dozen survived on the Turkestan plot, a stand which we did not consider sufficient to justify us in allowing it to remain.

This experience would lead us to believe that the Turkestan is slightly more hardy than the common variety; but not sufficiently so to withstand the severe conditions which sometimes prevail in this State.—JAMES ATKINSON, *Assistant in Agriculture*.

KENTUCKY.

State Experiment Station, Lexington.

The Samarkand alfalfa seed was planted (three-eighths of a pounds to one-eighth of an acre) May 21, 1898. It produced only a fair stand, which, August 21, was 6 inches high—an even growth, but rather spindling. All through this season it looked weak and unpromising. In 1899 it appeared much stronger. Under date of May 23, 1899, I find the following among my notes: "This plot,

started from seed furnished by the Department of Agriculture, is now in excellent condition, averaging about 16 inches high and densely covering the ground with a fine green growth, among which some purple heads can be seen. I can see no difference between it and other alfalfa." August 23, 1899, the plat was again noted as in excellent condition and the growth about 18 inches high, with some bloom. It was cut, and material was secured for chemical analysis. We have had in the experiment farm for many years a plat of alfalfa started from seed obtained from an eastern seedsman. It looks and behaves much like Samar-kand alfalfa. Both withstand drought well; both hold their own against weeds very well. The older plat has furnished two cuttings during some specially favorable seasons, but at other times would produce but a scant cutting. It has held its own, however, better than the red clover planted near it. It must be added that the soil is rather sterile for this region, and otherwise is not well adapted to the plant. We are starting new plats in better land this spring and may have a more favorable report to make later.—H. GARMAN, *Botanist*.

LOUISIANA.

State Experiment Station, Audubon Park.

The Turkestan alfalfa received by us and distributed by the Section of Seed and Plant Introduction was duly received and planted. It was rather late in the season to plant alfalfa, which is usually done here in early October, and from this cause and, perhaps, from defect in the seed, we did not obtain as good a stand as we usually do. However, we have still growing over an acre of this crop from the seed sent us. There are growing near it several acres of alfalfa from our home-grown seed, and the difference in growth is very noticeable. Our home-grown gives us from six to eight cuttings per year; the Turkestan has given only three to four. During the winter just passed we have not cut the Turkestan at all; in fact, it remained almost stationary from last October up to the present time. It has now the appearance of putting on a new growth. In the meanwhile, we have cut the home-grown alfalfa twice during the winter. The plants seem to be identical, but I fear the Turkestan variety is not yet acclimated to our environments. We intend this year to let it go to seed in order that we may experiment afresh with the seed grown from that sent us.—W. C. STUBBS, *Director*.

MARYLAND.

State Experiment Station, College Park.

We made every effort to get a stand of the Turkestan alfalfa, but failed to do so, partially on account of the failure of the seed to germinate and partially on account of the very dry weather which prevailed throughout the growing season of 1898, so that, on the whole, our test with the seed was a failure.—H. J. PATTERSON, *Director*.

MISSOURI.

State Experiment Station, Columbia.

The alfalfa seed from Turkestan, furnished by the Department of Agriculture, was sown April 26, 1898, on carefully prepared seed bed and lightly covered with a hand rake and rolled. Only a small proportion of the seed germinated, and many of the plants died apparently from the excessive heat of July and August. The stand was further reduced by the alternate freezing and thawing of the following spring, leaving so small a number of the plants that the plats were abandoned. This alfalfa does not seem to be quite so hardy as the common alfalfa.—H. J. WATERS, *Director*.

NEBRASKA.

State Experiment Station, Lincoln.

On May 24, 1898, a one-tenth acre plat of ground was seeded to Turkestan alfalfa by drilling with a press drill in rows 6 inches apart. The seed began to come up on May 30, giving a good stand. It was cut three or four times during the summer to keep down the weeds, but no crop of alfalfa. In 1899 it was cut on June 15, yielding at the rate of one and seven-hundredths (1.07) tons of hay per acre. This was considerably less than the yields obtained from ordinary alfalfa in nearby fields cut at the same time. The other fields were older, but one sown in 1897 gave in 1898 a yield of two and one-half tons of hay to the acre and in 1899 two and one-quarter tons. Our experience with the Turkestan

alfalfa would indicate that it does not produce as heavy yields as does the ordinary variety. It seems, however, to have a somewhat smaller leaf and thinner stem, which would indicate a somewhat higher feeding value. During the winter of 1898-99, which was a very severe one in this region, the Turkestan alfalfa suffered absolutely no loss from winter-killing, while the ordinary alfalfa killed out to some extent.—T. L. LYONS, *Acting Director*.

NEW JERSEY.

State Experiment Station, New Brunswick.

The Turkestan alfalfa sent to us by the Department of Agriculture was given a trial on a plat of ground containing one-fifth of an acre. The soil was a medium clay loam, well drained. The seed was sown May 14, 1898, at the rate of thirty pounds per acre, and a good stand was secured. The yield the first season (1898) was at the rate of 7.5 tons per acre from two cuttings. The second season (1899) four cuttings yielded at the rate of 9.42 tons per acre. Four-fifths of an acre of the variety which is commonly grown was sown at the same time as the Turkestan and yielded the first season (1898) at the rate of 8 tons per acre from two cuttings, and the second season at the rate of 20.2 tons per acre from four cuttings, and was much more vigorous than the Turkestan variety. The results indicate that the common variety is superior to the Turkestan for this locality.—C. B. LANE, *Assistant in Dairy Husbandry*.

NEW MEXICO.

State Experiment Station, Mesilla Park.

On the 12th of April, 1898, six pounds of Turkestan alfalfa seed were sown broadcast on one-fourth of an acre. The seed was covered with an ordinary tooth-harrow, and on the same day it was irrigated to produce germination. By the 4th of May the alfalfa was growing quite well, but the ground had baked and cracked considerably; and in order to help the weaker plants break through the crust, another irrigation was given on this date. Notwithstanding the fact that the seed had been sown late in the season, the germination was good and uniform. The first crop was cut June 13, when the alfalfa was about a foot high but was not yet in bloom. On the 17th, four days after cutting, it was irrigated to start the new growth. On July 21 the second crop was cut, but owing to the lack of water to irrigate with and the drought, the alfalfa made a short crop. During the rest of the season the alfalfa made a very short growth, as the drought continued and there was no water for irrigation. The Turkestan alfalfa, under similar conditions, will grow as well and yield as much as our common alfalfa (*Medicago sativa*) in this region. There seems to be no material difference between the two varieties in their drought-resisting qualities.—FABIAN GARCIA, *Assistant Agriculturist*.

NEW YORK.

Cornell Experiment Station, Ithaca.

The Turkestan alfalfa seed, which was received by the Cornell University Experiment Station, was planted on a gravelly loam soil in May, 1898. The soil was one especially subject to effect of droughts, and no fertilizer has been applied for the past five years. The alfalfa seed germinated quickly, and the plants made good growth. Three cuttings were made in 1898. During the winter of 1898-99 a portion of the alfalfa was killed by the ice which formed over it. Seed was sown upon the patches killed out, and a good growth was secured during the season of 1899. We cut the alfalfa four or five times during the season. From what I have seen of it, I should say that for our soil it is not as valuable as our common alfalfa or lucern.—L. A. CLINTON, *Assistant Agriculturist*.

OHIO.

State Experiment Station, Wooster.

We sowed the Turkestan alfalfa seed April 29 on a piece of land previously well prepared. The soil would be designated as clay loam, with a subsoil definitely clay. This alfalfa made a fair stand, but by the first of July had nearly all died out or disappeared. This has been the common experience with alfalfa here. It does not seem to be adapted to the soil, I think, for the reason

that it is rather too tenacious in its make up. It has been our greatest difficulty to secure a stand of alfalfa, but when we get it started it does well and holds well in the ground.—J. FREMONT HICKMAN, *Agriculturist*.

OKLAHOMA.

State Experiment Station, Stillwater.

The Turkestan alfalfa seed received from the Department of Agriculture was sown alongside of some Kansas-grown seed. Last season was a poor one for the alfalfa yields, though the stand was not seriously affected. No comparative yields were obtained, and at this time no appreciable difference exists between the stand and vigor of the plants on the two plats, both starting off vigorously and giving promise of good yields this season.—JOHN FIELDS, *Director*.

RHODE ISLAND.

State Experiment Station, Kingston.

The Turkestan alfalfa, of which the seed was sent here in 1898, was tested on the station grounds. It germinated well and came through the winter of 1898 and 1899 in excellent condition, showing itself as hardy as the other five lots of alfalfa, the seed of which came from different States and was also being tested. In yield it was a fair average with the others. A part was sown on ridged and a part on level land, to see under which method of cultivation it would winter best. So little difference was noticeable as to make no practical difference in favor of either method.—J. A. TILLINGHAST, *Assistant, Field Experiments*.

SOUTH CAROLINA.

State Experiment Station, Clemson.

I received the Turkestan alfalfa too late for spring planting in 1898. Planted on alluvial river bottom in July, August, and September following. The July and September plantings vegetated well, the August planting poorly. All plants disappeared during the late fall and winter, probably on account of the very wet season, as alfalfa sown near by failed in the same way. No experiment was made on upland.—J. S. NEWMAN, *Agriculturist*.

SOUTH DAKOTA.

State Experiment Station, Brookings.

I have just made a careful examination of the Turkestan alfalfa sown in the spring of 1898, and find that it has stood the winter well. All the plants seem to be alive and are beginning to make a strong, vigorous growth.

The winter of 1898-99 was a very severe one on all kinds of meadows, and nearly all clover in this locality was completely killed out. The Turkestan alfalfa, however, was not injured. The past winter was very mild and open and not so trying upon meadows, but there was no snow to protect the alfalfa; it has come through this, its second winter, in fine shape and is now well established, and is certainly the most promising variety of alfalfa yet tried in this locality.—E. C. CHILCOTT, *Vice Director and Agriculturist*.

WYOMING.

State Experiment Station, Laramie.

Following is a brief report of our results with Turkestan alfalfa from seed furnished by the Department:

Sown in spring of 1895.—Not cut that season.

In 1896 the plat was cut only once (September 21), and the yield was small.

In 1897 it was allowed to go to seed, but was planted so thickly that the seed failed to ripen here, as the seasons are very short.

In 1898, cut August 3; yield, 6,446 pounds per acre. Cut a second time, September 15; yield, 943 pounds per acre. Total yield, 7,389 pounds per acre, cured hay.

In 1899, cut July 20; yield, 4,717 pounds per acre. Cut a second time September 18; yield, 3,145 pounds per acre. Total yield, 7,862 pounds per acre, cured hay.

Average yield last 2 years, Turkestan alfalfa: First cutting, 5,581 pounds; second cutting, 2,044 pounds; total for season, 7,625 pounds cured hay.

Average yield last 2 years, common variety: First cutting, 4,620 pounds; second cutting, 1,710 pounds; total for season, 6,330 pounds cured hay.

The winter of 1898-99 was unusually severe. The plat of Turkestan alfalfa was not affected, while the common variety suffered winter killing to a considerable extent.—B. C. BUFFUM, *Vice Director and Agriculturist*.

SUMMARY.

The results thus far reported are at first glance apparently quite contradictory, particularly with respect to the tests made at the State Experiment Stations. If these reports are analyzed closely, however, it will be seen that the results are what might be expected from our knowledge of the Turkestan alfalfa and the natural conditions under which the variety has been developed. The reports from the region west of the Mississippi River and north of Kansas and California indicate that this variety is hardier and more productive than that commonly grown in this region. It seems to endure drought better, is not so easily affected by freezing, and gives better results on strongly alkaline soils. In the East, however, where there is a heavy rainfall and where heavy soils predominate, this variety seems to be little, if any, superior to the French or Chilean varieties; in fact, it seems certain that, in some localities at least, it is less valuable. In the South so few tests have been made that no definite conclusions can be drawn, the reports from some sections being favorable to the Turkestan alfalfa, while those from others indicate that the commonly grown varieties are more valuable. In the extreme Southwest the results are as yet quite contradictory, and further experimentation is needed.

The seed of Turkestan alfalfa will germinate much quicker and the plants start into growth earlier under the same conditions than common alfalfa. The plants are more leafy, grow more rapidly, and have a stronger, more vigorous root system. Another advantage which the Turkestan variety has is that the stems are more slender and less woody, the plants making a more nutritious hay of finer quality. That it will withstand drought under the same conditions better than ordinary alfalfa, seems certain from the reports of the experimenters. In the West and Northwest, at least, it seems to be more productive, both with and without irrigation.

There is every indication that the introduction of this variety will result in a very marked extension of the area devoted to the cultivation of alfalfa, and this, too, in sections where the forage problem is one of paramount importance, and where heretofore climatic conditions have largely prohibited the growing of leguminous forage crops.

P. BEVERIDGE KENNEDY, Ph. D.,
Expert and Agent in Charge of Experimental Work.